

## Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate)

### HOW TO USE THIS JTA:

For each of the following assessment methods, the Candidate must:

#### On the written examination:

- **Understand** the following general concepts that do not have a specified value, procedure, or measurement (e.g., understand the significance of the Test Method); *and*
- **Know** the following specific procedures or values (e.g., know the specified reporting accuracy); performance of these items may also be assessed on the performance examination.

#### On the plans-reading examination:

- **Identify** the following concepts to utilize engineering drawings.

### RESOURCES:

ACI Concrete Terminology

ACI 117, *Specification for Tolerances for Concrete Construction and Materials*

ACI 213R, *Guide for Structural Lightweight-Aggregate Concrete*

ACI 301, *Specifications for Structural Concrete*

ACI 302.1R, *Guide to Concrete Floor and Slab Construction*

ACI 304R, *Guide for Measuring, Mixing, Transporting, and Placing Concrete*

ACI 304.2R, *Placing Concrete by Pumping Methods*

ACI 305R, *Guide to Hot Weather Concreting*

ACI 306R, *Guide to Cold Weather Concreting*

ACI 308R, *Guide to Curing Concrete*

ACI 309R, *Guide for Consolidation of Concrete*

ACI 318, *Building Code Requirements for Structural Concrete*

ACI 347R, *Guide to Formwork for Concrete*

ACI SP-2, *Manual of Concrete Inspection*

International Code Council (ICC), 2015 International Building Code (IBC)

CRSI Manual of Standard Practice

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### ACI Concrete Terminology

- Know definition of absorption.
- Know definition of absorbed water.
- Understand types of admixtures: accelerators, retarders, plasticizers etc.
- Know definition of aggregate blending.
- Understand purpose of air entrainment.
- Understand architectural concrete.
- Understand weights.
- Understand blended cement.
- Understand central-mixed concrete.
- Know a construction joint.
- Know controlled low-strength material (CLSM).
- Know crack-control reinforcing.
- Know curing including agents, blankets, and compounds.
- Understand dowels.
- Know expansion joints.
- Understand fiber-reinforced concrete.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand heat of hydration.
- Know quality assurance and quality control.
- Understand water-cement and water-cementitious ratio.

### ***ACI 117, Specification for Tolerances for Concrete Construction and Materials***

- Know the document is a narrative to the specification and not part of the specification.
- Know that the tolerances are a means to establish permissible variation in dimension and location.
- Know that the specified degree of accuracy has a direct impact on the cost of production and the construction method.
- Understand that the finish and architectural details are compatible with the type and anticipated method of construction.
- Know mandatory tolerances required for concrete construction that can be referenced in the contract documents include: ITG-7, 301, 303.1, 336.1 and 530.1.
- Know that the specification does not apply to specialized structures, such as nuclear reactors and containment vessels, bins, prestressed circular structures and single family homes.
- Know that preconstruction tolerance coordinating meetings shall be scheduled and held prior to commencement of the work.
- Understand that the tolerances are not cumulative and the most restrictive tolerance controls.
- Know that if the tolerances in ACI 117 are exceeded for structure concrete, refer to contract documents for acceptance criteria.
- Understand definitions from ACI CT and ACI 117.
- Know how to apply tolerances for reinforcing steel fabrication and assembly.
- Know reinforcing steel location tolerances.
- Know the placement of embedded items.
- Know required concrete batching tolerances of concrete constituent materials.
- Know tolerances for slump and air content of concrete.
- Know how to apply tolerances presented in ACI 117.

### ***ACI 213R, Guide for Structural Lightweight-Aggregate Concrete***

- Understand terms related to lightweight-aggregate concrete.
- Understand what is meant by specified-density concrete.
- Know types of lightweight aggregates (natural and man-made).
- Understand properties of lightweight aggregate and their impact on concrete.
- Understand particle shape and surface texture.
- Understand grading required and impact on density.
- Know importance of moisture condition.
- Understand mix proportioning criteria.
- Understand specified physical properties:
  - Compressive strength
  - Density
  - Slump
  - Entrained-air content
- Understand that workability is an important property.
- Understand proportioning and adjusting mixes.
- Understand the difference between absolute volume and volumetric mix design.
- Know requirements for mixing and delivery.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand lightweight concrete basic placement principles, including pumping.
- Understand the considerations necessary when pumping lightweight concrete.
- Understand curing and internal curing with lightweight concrete.
- Understand field practices for controlling lightweight concrete properties in the field.
- Understand lightweight concrete strength range values.
- Understand equilibrium density and oven dry density.

### **ACI 301, *Specifications for Structural Concrete***

- Know scope, specified, and not specified work.
- Understand definitions.
- Understand submittals.
- Know testing and inspection, acceptance of structure, and protection of in-place concrete.
- Understand formwork and formwork accessories.
- Understand construction and erection of formwork.
- Understand removal of formwork.
- Understand reshoring and backshoring.
- Know strength of concrete required for removal of formwork.
- Understand reinforcement and reinforcement supports.
- Understand concrete tolerances.
- Understand concrete cover.
- Understand concrete mixes.
- Know concrete mixture quality control.
- Understand performance and design requirements.
- Know delivery requirements.
- Understand handling, placing, and constructing.
- Understand submittals.
- Understand concrete placement execution preparation.
- Understand concrete placement.
- Understand finishing formed surfaces.
- Understand finishing unformed surfaces.
- Understand sawed joints.
- Understand curing and protection.
- Understand architectural concrete.
- Understand quality control for architectural concrete.
- Understand architectural concrete execution.
- Understand criteria of final acceptance.
- Understand lightweight concrete.
- Know aggregate storage and handling, and density acceptance requirements.
- Understand mass concrete.
- Know maximum temperature and temperature difference requirements.
- Understand mass concrete execution requirements.
- Understand post-tensioned concrete requirements.
- Know stressing jack calibration, stressing records, material handling, sheathing inspection and repair, and placing tolerance requirements.
- Understand post-tensioned concrete quality control.
- Understand shrinkage-compensating concrete general requirements.

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- Understand shrinkage-compensating concrete execution requirements.
- Understand industrial floor slabs general requirements.
- Understand industrial floor slabs execution requirements.
- Understand tilt-up construction general requirements.

**ACI 302.1R, *Guide to Concrete Floor and Slab Construction***

- Understand classes of floors on basis on intended use and final finish.
- Understand what should be the condition of the soil-support system.
- Understand base tolerances.
- Understand vapor barriers and fill.
- Know the importance of protection of fill from moisture.
- Understand elevation importance in suspended slabs.
- Understand bulkhead material and placement.
- Understand screed guides.
- Know concrete placement conditions.
- Understand materials for floors.
- Understand recommended concrete properties and consistency.
- Understand concerns when finishing air entrained concrete.
- Understand batching, mixing, and transporting concrete.
- Understand transporting concrete and discharge time.
- Understand jobsite slump control.
- Know delivery of concrete to point of discharge.
- Understand placing operations.
- Know tools for spreading, consolidating, and finishing.
- Know spreading, consolidating and finishing operations.
- Understand finishing all classes of floors.
- Understand application of dry shake hardeners during finishing operations.
- Understand finishing lightweight concrete.
- Understand nonslip floors.
- Understand decorative and nonslip treatments.
- Understand grinding as a repair procedure.
- Understand floor flatness and levelness.
- Understand treatment when bleeding is problem.
- Understand delays in cold-weather finishing.
- Know purpose of curing.
- Know methods of curing.
- Know length of curing.
- Know how to prevent plastic-shrinkage cracking.
- Understand protection of slab during construction.
- Understand joint filling and sealing.
- Understand a quality control checklist.
- Understand causes of floor and slab surface imperfections.
- Understand cracking of floor and slab surfaces.
- Understand low wear resistance of floor and slab surfaces.
- Understand dusting of floor and slab surfaces.
- Understand scaling of floor and slab surfaces.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand popouts of floor and slab surfaces.
- Understand blisters and delamination of floor and slab surfaces.
- Understand spalling of floor and slab surfaces.
- Understand discoloration of floor and slab surfaces.
- Understand low spots and poor drainage of floor and slab surfaces.
- Understand curling of floor and slab surfaces.
- Know how to evaluate surface imperfections.

### **ACI 304R, *Guide for Measuring, Mixing, Transporting, and Placing Concrete***

- Understand control, handling, and storage of materials.
- Understand storage methods to preserve the characteristics of coarse and fine aggregates.
- Know ways to store cement, alternative cementitious additives, and water to avoid contamination.
- Know measuring of the materials and tolerances to achieve homogeneous mix.
- Understand different types of batching systems.
- Know the types of mixing equipment.
- Know the differences between central and truck mixed concrete.
- Know recommended mixing practices.
- Understand proper transporting of concrete.
- Understand various types of equipment used for placement.
- Understand the consolidation process.
- Understand mass concreting placement.
- Understand joint preparation and finishing.
- Understand basic recommended practices for pre-placed aggregate concrete.
- Understand the maximum size and size distribution of the pre-placed aggregate concrete.
- Understand the materials and grout dosage for pre-placed aggregate concrete.
- Know the placement of aggregates for pre-placed aggregate concrete.
- Know grout mixing and pumping for pre-placed aggregate concrete.
- Understand basic recommended practices for concrete placing underwater.
- Know the properties of materials and proportioning to use for placing concrete underwater.
- Understand tremie system.
- Know precautions when placing concrete underwater.
- Know pumping equipment, pipeline, and accessories.
- Know materials and proportioning for pumpable concrete.
- Understand conveyor operation.
- Understand types of conveyors.
- Know materials for heavy weight and radiation shielding concrete.
- Understand concrete characteristics of heavy weight and radiation shielding concrete.
- Understand methods of placement for heavy weight and radiation shielding concrete.
- Understand lightweight structural concrete.
- Understand volume-weight batching of lightweight aggregate.
- Understand volumetric mixing and continuous-mixing concrete equipment.
- Understand fresh concrete properties produced by volumetric-measuring and continuous-mixing concrete equipment (VMCM).

### **ACI 304.2R, *Placing Concrete by Pumping Methods***

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand pumping equipment.
- Understand pumping safety.
- Understand pipeline and accessories.
- Understand couplings, gaskets, assembly, disassembly, and clean out.
- Understand proportioning pumpable concrete.
- Know how to apply sand fineness modulus (FM), coarse aggregate size, and required pipeline diameter.
- Know the importance of moisture condition of lightweight aggregate on pumping.
- Understand the effect that pumping has on slump control.
- Understand that pumping pressures are affected by length of pipe, diameter of pipe, and cu yd/hr.
- Understand field practices.
- Know hand signals.
- Know proper practices for field control of pumped concrete.

### **ACI 305R, *Guide to Hot Weather Concreting***

- Understand the different ways high ambient temperature can affect concrete and why.
- Know that ACI 305R identifies problems associated with hot weather concreting and offers suggestions to alleviate these.
- Know the different notations and definitions associated with ACI 305R.
- Understand the problems hot weather can create to both plastic and hardened concrete properties.
- Know the effect hot weather has on strength and strength development.
- Understand how evaporation and bleeding affect surface drying and the problems that can cause.
- Know that control measures are recommended when concrete evaporation rate exceeds 0.2 lb/ft<sup>2</sup>/h.
- Know how concrete temperature affects slump and water demand.
- Know how using cooled water or ice affects the concrete temperature and by how much.
- Understand how cement selection can have an effect on hot weather concrete performance.
- Know the impact of cement and aggregate temperature on the temperature of the concrete mixture.
- Understand that supplementary cementitious materials can impart a slower rate of setting and of early strength gain.
- Know the various types of chemical admixtures that may be beneficial in offsetting some of the undesirable characteristics of hot weather concrete.
- Understand the different trial batch procedures that can be used to anticipate water demand under hot weather conditions.
- Understand the various things that the ready mix producer can do to help control the temperature of the concrete.
- Understand the particular need for slump control as it relates to hot weather concreting and the problem with holding excessive water from the batch.
- Know that water additions in excess of the proportioned maximum water content is detrimental to the concrete and should be prohibited.
- Know what preparations should be made to transport, place, consolidate, and finish the concrete at the fastest possible rate while protecting against moisture loss.
- Know the different types of curing and their importance under hot weather conditions.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Know that high initial curing temperatures can negatively affect ultimate strength and durability to a greater degree than high placement temperatures of fresh concrete.
- Know what constitutes rapid cooling of the concrete and what problems it can cause.
- Know the problems associated with testing of concrete under hot weather conditions, particularly proper curing of test specimens.
- Know the Appendix in ACI 305R contains a method for estimating the temperature of concrete.

### **ACI 306R, *Guide to Cold Weather Concreting***

- Know the definition of cold weather and its effect on concrete.
- Know that ACI 306R is not a specification. For mandatory language, see ACI 306.1.
- Understand the different notations and definitions associated with ACI 306R.
- Know the safety aspects, importance of curing, and avoidance of excessive temperature stresses.
- Understand principals of early age strength to avoid damage by freezing.
- Understand certain strength levels are needed for project conditions (form removal, etc.).
- Understand the economic impact of cold weather concreting.
- Understand planning/preparation is critical for proper CWC practice.
- Understand that excessive heating of concrete can be detrimental.
- Understand the importance of temperature measurements.
- Understand heated enclosure benefits and cautions to avoid overheating, carbonation, or uneven protection.
- Know that hard troweling air entrained concrete can result in surface problems such as blistering or delamination.
- Know that bleed water remains at the surface longer during CWC and a longer time is required before finishing operations can begin without finishing this water back into the exposed surface.
- Understand the importance of placement temperature and to not exceed the recommended placement temperature by more than 20°F (11°C) shown in Table 5.1.
- Understand that adjusting concrete mixing temperature can offset heat loss between point of mixing and placing.
- Know the benefits and cautions when heating mix water or aggregates for CWC.
- Understand the equation used to determine final concrete temp when temps of constituents are known.
- Know the concrete temperature loss to be expected when using different delivery methods: revolving drum, covered dump, open-top dump.
- Know that not revolving a ready-mix drum will result in less heat loss than a rotating drum or an uncovered dump.
- Understand that surfaces that receive fresh concrete should not be below temperature minimums provided in Table 5.1.
- Understand that (massive) metal embedments (>1 in.<sup>2</sup>) can freeze surrounding fresh concrete and reduce the reinforcing bond. Precautions such as heating metals can prevent such negative effects.
- Know concrete must not be placed on frozen ground.
- Understand that different levels or durations of protection(s) are required for different types and shapes of building elements.
- Know there are various options to protect concrete against early-age freezing.
- Know that attaining a penetration resistance of 500 psi (3.5 MPa) only protects concrete against early freezing. A strength level of 3500 psi (24.5 MPa) is needed to withstand repeated freezing and thawing cycles.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand CWC period for protection and curing vary for different loading conditions.
- Understand Tables 5.1 and 7.1.
- Understand the importance of gradual concrete temperature drop following curing.
- Know that massive structures can be more susceptible to thermal cracking due to relatively greater temperature gradients.
- Understand that structural members (elevated slabs, beams, and girders) require longer protection time than provided in Table 7.1.
- Know the care needed for field cured cylinders.
- Understand other methods to assess in-place strength of CWC.
- Understand strength levels attained via early protection and curing must be high enough for the CWC to attain later age design strength.
- Understand there are numerous optional approaches to increase early-age strength.
- Understand the importance of gradual cooling.
- Understand that Table 8.2 provides conservative guidance of levels of strength achieved at different temperatures and cement types.
- Understand the importance of proper steps in form removal: minimum strength for removal, estimations of strength, and especially re-shoring.
- Understand job conditions to be met to support duration of recommended protection for percentage of standard-cured 28-day strength.
- Understand common assumptions to be considered when modeling is utilized to predict concrete-time and temperature properties.
- Know the degree of CWC protection required is dependent on ambient conditions, geometry of structure or member, and the mix design.
- Understand a variety of insulating materials can be used to retain heat of hydration of CWC.
- Understand the different materials and thicknesses provide different R values and the selection of insulation should yield an R Value to protect against current ambient conditions for the duration specified (3d or 7d).
- Understand Table 9.5 can be used to determine thickness of insulation after accounting for ambient conditions and type of forms used.
- Understand the purpose, proper use, and function of hydronic heaters in CWC work.
- Understand the difference and cautions when using different types of heating approaches: direct and indirect fired, and hydronic heaters.
- Understand the effectiveness of enclosures and the benefits provided to workers and the overall quality of CWC work albeit at a relatively higher cost. Caution NOT to add excessive heat that could result in hot weather concrete issues within the CWC enclosure.
- Understand internal heating as yet another option for CWC protection. This includes heating from below or using heat transfer tubing.
- Understand the importance of monitoring temperatures to verify adequate protection has been provided. Understand proper placement and embedment depth of thermistors and thermocouples is important to provide useful data.
- Understand even temporary removal of protection can only be allowed if the newly placed concrete will not freeze. Protection time during removal is not counted toward the recommended degree-hours needed and must be made up with twice the number of any lost degree-hours.
- Know that when using insulated forms, temperatures should be monitored both internally and at the surface of the concrete to help avoid excessive heating (especially for mass concrete placement).



## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Know that for newly placed CWC that protection against rapid evaporation and freezing is needed while new concrete is at critical saturation, in some instances even after the end of the curing period.
- Understand the various approaches to accelerate concrete setting time and strength development and possible cost savings as well as negative effects to avoid for each of the available options.

### **ACI 308R, *Guide to Curing Concrete***

- Understand the process of curing and how it affects the properties of hardened concrete.
- Understand when deliberate curing procedures are required.
- Understand the different phases of curing.
- Know the timing of finishing operations.
- Know the timing of curing procedures.
- Understand curing of formed surfaces.
- Understand durations for curing procedures.
- Understand the effects of curing on hardened concrete properties.
- Understand curing water quality.
- Know initial curing procedures.
- Know final curing procedures.
- Understand procedures for termination of curing.
- Know cold weather curing procedure.
- Know hot weather curing procedures.
- Understand accelerated curing.
- Understand minimum curing requirements.
- Understand factors that influence curing duration.
- Know curing requirements for slabs.
- Know curing requirements for building bridges and other structures.
- Know curing requirements for mass concrete.
- Know curing requirements for decorative concrete.
- Know the requirements for monitoring concrete curing.
- Understand how to evaluate environmental conditions.
- Know how to evaluate evaporation rates.
- Understand methods for verifying application of curing.
- Understand methods for monitoring curing effects.

### **ACI 309R, *Guide for Consolidation of Concrete***

- Understand general information about concrete consolidation.
- Understand the workability and consistency of concrete.
- Know methods of consolidation.
- Understand concrete vibratory motion.
- Understand the process of consolidation.
- Understand equipment for vibration, including internal vibrators.
- Understand range characteristics, performance, and applications of vibrators.
- Understand form vibrators.
- Understand surface vibrators.
- Understand importance of form tightness.
- Understand forms for external vibration.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand vibration practices for proper consolidation.
- Understand consequences of improper vibration.
- Understand methods of consolidation for structural concrete.
- Understand vibration practices for mass concrete.
- Understand surface vibration for normal-density concrete floor slabs.
- Understand vibration procedures for pavements.
- Understand special precautions when consolidating pavements.
- Understand choice of consolidation methods for precast products.
- Understand behavior of structural low-density concrete during vibration.
- Understand consolidation equipment and procedures for structural low-density concrete.
- Understand placing techniques for high-density concrete.
- Understand QC/QA of consolidation.
- Know consolidation methods of test specimens for strength, density, and air content.
- Understand common placing problems and techniques when consolidating in congested areas.

### **ACI 318, *Building Code Requirements for Structural Concrete***

- Understand 318 development considerations with respect to; historical background, minimum standards, legal status, contract disputes, testing and certification, etc.
- Know scope and minimum  $f'c$  2500 psi with no max.
- Know code governance.
- Know construction material testing rights, requirements, and records of test.
- Understand code notation terms, symbols, and definitions.
- Understand anchoring to concrete.
- Know anchoring to concrete, scope, general requirements, and installation and inspection of anchors.
- Understand concrete exposure categories and classes.
- Understand exposure class mixture requirements.
- Understand additional requirements for freeze-thaw and sulfate exposure.
- Know concrete protection for reinforcement.
- Understand embedment in concrete and construction joints.
- Know spacing limits for reinforcement.
- Know standard hooks.
- Know minimum bend diameters.
- Understand what a contract document should look like.
- Understand relevant specification requirements for cementitious materials, aggregates, water, steel reinforcement, and admixtures.
- Understand general concrete mixture proportion requirements.
- Know nominal maximum coarse aggregate size requirements.
- Know admixture limits on calcium chloride use.
- Know proportion without field experience requirements.
- Know average compressive strength reduction with field experience data.
- Know material storage requirements.
- Know preparation of equipment and place of deposit.
- Know mixing.
- Know conveying.
- Know depositing.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Know curing.
- Understand hot and cold weather requirements.
- Know surface conditions of reinforcement.
- Know placing reinforcement.
- Know bending.
- Know reinforcing bar welding requirements.
- Know design of formwork.
- Know removal of forms, shores, and reshoring.
- Know evaluation and acceptance of concrete: frequency of testing, standard-cured specimens, field cured specimens, and investigation of low-strength test results.
- Understand concrete construction inspection requirements.
- Know minimum inspection record requirements.
- Understand steel reinforcement information.
- Understand reinforcement details for columns, connections, transverse reinforcement for compression and flexural members, shrinkage and temperature reinforcement, and requirements for structural integrity.

### **ACI 347R, *Guide to Formwork for Concrete***

- Understand how to check formwork drawings vs. structural design.
- Understand how to check location of embedments, penetrations, or depressions for architectural, mechanical, or electrical work based on drawings.
- Understand specifications and contract documents.
- Understand safety precautions that should be in place.
- Know fabrication and assembly details.
- Understand the necessary items to check for formwork such as measures, plumb, level, alignment, cleanliness, and coatings.
- Know correct construction operations for formwork.
- Understand inspections and adjustments of formwork.
- Understand form removal sequence and concrete strength for form removal.
- Understand required minimum strength for form stripping.
- Understand time and strength requirements for form removal.
- Understand formwork materials and inspection.
- Understand that previous document requirements also apply to architectural concrete.
- Understand mockup.
- Understand tolerances for formwork.
- Understand construction of forms for architectural concrete.
- Understand form removal for architectural concrete.
- Understand formwork for special structures should be according to Chapters 1-6.
- Understand requirements for bridges and viaducts, including piers.
- Understand erection and removal of formwork designed for composite action.
- Understand erection and removal of formwork for folded plates, thin shells, and long-span roof structures.
- Understand construction of underground forms.
- Understand construction of preplaced-aggregate concrete.
- Understand slipformed concrete.
- Understand slipforming operation.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand requirements for permanent forms.

### **ACI SP-2, *Manual of Concrete Inspection***

- Understand why inspection is needed.
- Understand the purposes of inspection.
- Understand the difference between:
  - Owner inspection for quality assurance.
  - Contractor inspection for quality control.
- Understand the duties of inspectors.
- Understand the importance of inspector education and certification.
- Understand basic statistical concepts and terms:
  - Test result
  - Average result
  - Distribution curve
  - Standard deviation
- Understand use of control charts.
- Understand sampling concepts.
- Understand computing standard deviation and required average compressive strength.
- Understand the various types of cementitious materials commonly used in concrete.
- Understand the basic properties of aggregate materials and tests commonly employed to check properties.
- Understand criteria for acceptable mixing water.
- Understand basic types and uses of concrete admixtures.
- Understand basic types and condition requirements for steel reinforcement.
- Understand basic use and application of curing compounds.
- Understand basic types and usage of joint materials.
- Know requirements for proper storage and handling of cement.
- Know requirements for proper storage and handling of aggregates.
- Know requirements for proper storage and handling of supplementary cementitious materials.
- Know requirements for proper storage and handling of admixtures.
- Understand the basic components of concrete.
- Understand the advantages of low w/cm.
- Understand concrete properties that affect workability.
- Understand the causes and effects of bleeding and settlement.
- Understand the importance of consolidation.
- Understand the basic concepts of cement hydration, setting, and hardening.
- Understand that hydration of cement produces heat.
- Understand the effects of proper curing.
- Understand basic properties that effect concrete strength.
- Understand the importance of durability.
- Understand common types and sources of chemical attack.
- Understand the effects of freeze-thaw.
- Understand the effects of alkali-silica reactivity.
- Understand the basic causes and effects of concrete volume change.
- Understand factors considered in proportioning concrete.
- Understand that different methods of specifying concrete requirements may be encountered.

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- Know how to compute absolute volume of concrete materials.
- Know how to adjust aggregate and mixing water batch weights based upon free-moisture in the aggregates.
- Know how to calculate yield of concrete.
- Understand basic types of batching operations:
  - Manually
  - Semi-automatically
  - Automatically
- Know the allowable tolerances for batch weights of materials as specified in ASTM C94.
- Understand the basic components and equipment used to measure and batch concrete materials.
- Understand the basic types of mixing and delivery systems which may be employed for concrete.
- Understand the scope of duties involved during plant inspection of concrete production.
- Know important inspection criteria and field tests commonly employed during placement of concrete.
- Know inspection criteria for condition of subgrade, forms, reinforcement, and embedded items prior to concrete placement.
- Know the types of joints used in concrete construction and their usage:
  - Isolation joints
  - Contraction joints
  - Construction joints
- Understand the importance of utilizing an inspection checklist.
- Understand the importance of assessing the effects of placement condition and weather on the concrete placement.
- Know proper practices and common methods employed for handling, conveying, and delivery of concrete to forms.
- Know proper practices and common methods employed for consolidation of concrete.
- Know proper practices and common methods employed for finishing of concrete.
- Know proper practices for installing construction joints and for preparing joint surfaces prior to further placement of concrete.
- Know basic considerations involved in determining:
  - Time of form removal
  - Need for reshoring
  - Protection from damage due to construction loads
- Know the importance of curing and methods commonly employed for moist curing and accelerate curing.
- Know the conditions which constitute cold weather concreting and methods employed for protection of concrete.
- Know the conditions which constitute hot weather concreting and methods employed to offset negative effects of hot weather.
- Understand that acceptance inspection may also include:
  - Confirmation of as-built dimensions
  - Examination for defects in exposed surfaces
  - Analysis of acceptability of all inspection and tests performed
- Understand the scope of activities and techniques employed when conducting a visual condition survey of concrete.
- Understand the types of destructive and nondestructive tests and examinations which may be employed to evaluate concrete quality.

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- Understand the differences between minor defects and structural defects in concrete.
- Understand the methods employed in positioning reinforcement in slabs.
- Understand desirable concrete properties for interior and exterior slabs.
- Understand the importance of sub-grade preparation for slabs-on-ground.
- Understand the importance of consolidation.
- Understand basic practices for proper finishing of concrete.
- Understand basic practices for applying floor hardeners.
- Understand basic concepts of two-course slab construction.
- Understand additional requirements to consider for structural slabs.
- Understand methods employed for joint construction and installation.
- Understand the importance of quality subgrade and subbase courses.
- Understand basic concepts of fixed-form and slipform paving.
- Understand storage and installation requirements for steel reinforcement.
- Understand basic concepts employed for material storage, proportioning, batching, and mixing of concrete.
- Understand basic concepts employed for paving operations including concrete placement, vibration, slipform paving, fixed-form paving, finishing, texturing, curing, and protection.
- Understand criteria typically involved in acceptance of pavement.
- Understand types and usage of various joints and sealants employed for pavements.
- Understand basic concepts associated with placing bridge decks.
- Understand that architectural concrete will often require unusual care to produce concrete surfaces with special visual appearance.
- Understand the importance of preconstruction samples, design reference samples, full-scale mockups, and concrete finish demonstrations.
- Understand the importance of visual uniformity.
- Understand types of forms and form treatments that may be employed.
- Understand the importance of proper placement of reinforcement.
- Understand the importance of controlling concrete materials, mixture proportioning, batching, mixing, transporting, placing, and consolidation.
- Understand surface treatments typically employed.
- Understand the importance of curing and protection.
- Understand the importance of having established repair provisions.
- Understand the importance of careful handling and transportation of precast members.
- Understand criteria typically employed for acceptance inspection of finished products.
- Understand basic concepts of slipform construction for structures and pipes.
- Understand basic concepts of tilt-up construction.
- Understand basic concepts of lift-up construction.
- Understand basic concepts of preplaced-aggregate concrete.
- Understand basic concepts of underwater concrete construction.
- Understand basic concepts of vacuum dewatering of concrete.
- Understand basic concepts involved with placing and testing pumped concrete.
- Understand basic concepts and processes utilized for shotcrete.
- Understand basic concepts for lightweight concrete including materials employed, mixture proportioning and control, testing, batching, mixing, placing, consolidation, finishing, curing, and protection.
- Understand basic concepts for materials, mixing, and proportioning of lightweight fill concrete.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand basic concepts for low-density concrete for insulation purposes including: materials employed, mixture proportioning and control, testing, batching, mixing, placing, consolidation, finishing, curing, and protection.
- Understand basic concepts for heavyweight concrete including materials employed, mixture proportioning and control, testing, batching, mixing, placing, consolidation, finishing, curing, and protection.
- Understand basic concepts of mass concrete for dams including: mixture proportioning and control, testing, temperature control, and special equipment and procedures.
- Understand how structural mass concrete differs from mass concrete for dams.
- Understand basic concepts for shrinkage-compensating concrete including: materials employed, mixture proportion and control, testing, production placing, finishing, curing, and protection.
- Understand basic concepts involved with high-performance concrete (HPC).
- Understand inspection duties typically required for precast concrete including scope of duties at precast plants, differences between quality control and quality assurance inspections, record keeping and test reports, attention to embedments, bar and wire reinforcement, curing, lifting, erection, and repairs.
- Understand additional inspection duties typically required for precast prestressed concrete including materials employed, tendon handling and storage, deflection devices, tensioning of tendons, detensioning, draped strands, single and multiple strands, and post-tensioned tendons.
- Understand additional inspection duties typically required for cast-in-place prestressed concrete including: materials employed, post-tensioned tendons, ducts for grouted tendons, anchorages, tensioning procedures, grouting procedures, and post-construction inspection.
- Understand various procedures employed for installing grout mixtures including pressure grouting and grouting under base plates.
- Understand various types of grout mixtures including damp-pack grout, expansive grouts, non-shrink grouts, polymer enhances grouts, methods of placement, and testing.
- Understand uses and applications of mortar and stucco.
- Know commonly specified procedures for testing of concrete including:
  - Sampling – ASTM C172
  - Consistency – ASTM C143
  - Air content – ASTM C231, ASTM C173, and ASTM C138 (gravimetric)
  - Density – ASTM C138
  - Temperature – ASTM C1064
  - Casting and curing of strength test specimens – ASTM C31
  - End preparation of test specimen – ASTM C617 and ASTM C1231
  - Compressive testing of cylinders – ASTM C39
  - Flexural testing of beams – ASTM C78 and ASTM C293
  - Splitting tensile strength of cylinders – ASTM C496
  - Compressive strength of lightweight insulating concrete
- Understand basic concepts employed for accelerated curing.
- Understand methods and tests employed for conducting uniformity tests of mixers.
- Understand testing conducted to determine equilibrium density of lightweight concrete.
- Understand tests conducted on completed structures including compressive tests of cores, load tests, and various nondestructive tests and evaluations.
- Understand importance of proper handling and shipping on samples.
- Know general information to include on reports.
- Understand specific information included on reports.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand the importance of maintaining records.
- Know that ASTM C1077 requires that reports and related records be maintained for at least 3 years.
- Understand the importance of utilizing quality control charts.
- Understand the scope of information required for concrete delivery tickets by ASTM C94 as well as additional information that may be included on tickets.

### **ICC 2015 International Building Code**

- Understand that the IBC is a model code and the local building official may adopt all or parts of the code.
- Understand that a Special Inspector shall provide written documentation to the building official demonstrating competence and relevant experience and training.
- Know that records must be kept of special inspections and that copies shall be furnished to the building official and the registered design professional in responsible charge.
- Know how to document and communicate identified discrepancies and the need to report uncorrected discrepancies to the building official and the design professional in responsible charge.
- Know that work conducted by fabricators (e.g. precast manufacturers) is subject to special inspections.
- Know how to apply the requirements of Table 1705.3 for verification and inspection of concrete construction.
- Know that some inspection activities require periodic inspection while continuous inspection is required during:
  - Structural concrete and shotcrete placement
  - Application of prestressing forces
  - Grouting of prestressing tendons
- Understand that Chapter 19 contains reinforced concrete information that may be referenced in project specifications.

### **CRSI Manual of Standard Practice**

- Understand ASTM requirements and steel identification markings for reinforcing bars.
- Understand typical types and sizes of wire bar supports.
- Understand typical wire sizes and geometry.
- Know how to identify wire bar supports.
- Understand wire bar support protection classes.
- Understand precast concrete bar supports.
- Understand all-plastic bar supports.
- Understand side-form spacers.
- Understand recommendations for bar supports and epoxy-coated reinforcing bars.
- Know placing bar supports.
- Understand recommended industry practices for bar supports for one-way solid slabs.
- Understand recommended industry practices for bar supports for joists.
- Understand recommended industry practices for bar supports for beams and girders.
- Understand recommended sequence of placing bar supports and reinforcing bars in two-way flat plate.
- Understand recommended sequence of placing bar supports and reinforcing bars in two-way flat slab.



## **Job-Task Analysis (JTA) for ACI Certification of Concrete Construction Special Inspector (Incl. Associate) – *Continued***

- Understand recommended sequence of placing bar supports and reinforcing bars in two-way waffle flat slab.
- Understand bar supports for special conditions: one-way slabs on corrugated steel forms, and foundation mats and slabs on ground.
- Understand bar supports for highway bridge slab reinforcement.
- Know general recommendations for reinforcing bar placement.
- Know surface condition of reinforcing bars.
- Know field bending of reinforcing bars.
- Understand spacing of reinforcing bars.
- Understand splices in reinforcing bars including lap splices, mechanical splices, and welded splices.
- Understand embedment and extensions.
- Understand tolerances in placement.
- Understand bar supports.
- Understand concrete cover requirements.

### **Plans-Reading Exam**

- Identify drawing titles, numbers, revisions, and dates of approval.
- Identify reinforcing size, grade, location, spacing, and splicing requirements.
- Identify tolerances for location, spacing, and concrete cover of reinforcing in general comments or tables.
- Identify schedules for hooks, bends, ties, stirrups, and supplemental reinforcement.
- Identify schedules for shapes and sizes of concrete form sections (e.g.: footings, grade beams, columns etc.).
- Identify section details on plans.
- Identify information in the general requirements section.
- Identify information from multiple drawings in the plans.
- Identify the work location from the plans (stations, grid lines, detail references, etc.).
- Identify requirements for preparation of subgrade and formed surfaces.
- Identify requirements of joints and/or block outs in the plans.
- Identify concrete specification requirements (e.g.: design strength, slump, admixture, and exposure/durability requirements).
- Identify material and placement requirements for post tensioning steel, dowels, and other embedded items.